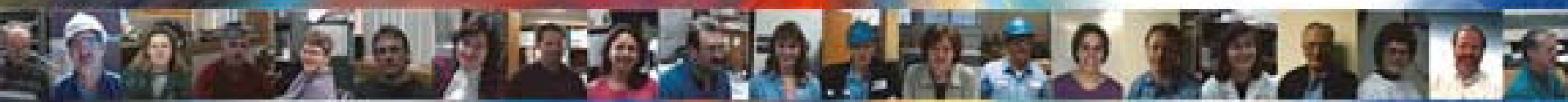
EERC Energy & Environmental Research Center

EERC Technology – Putting Research into Practice

"Longer-Term" Hg Emissions Variability

Dennis Laudal, *EERC*
Ralph Roberson, RMB Consulting
Paul Chu, *EPRI*
Lynn Brickett, *U.S. DOE NETL*



University of North Dakota

Key Partners

- Data analyses
  - Ralph Roberson, RMB Consulting
- Sampling leaders
  - Chad Wocken and Richard Schulz, EERC
  - Wei-Ping Pan, Western Kentucky University
- Co-sponsors
  - Paul Chu, EPRI
  - Lynn Brickett, DOE NETL
  - CW Lee, EPA
  - John Pavlish, CATM
- Power plants

“Longer-Term” Hg Emissions Variability

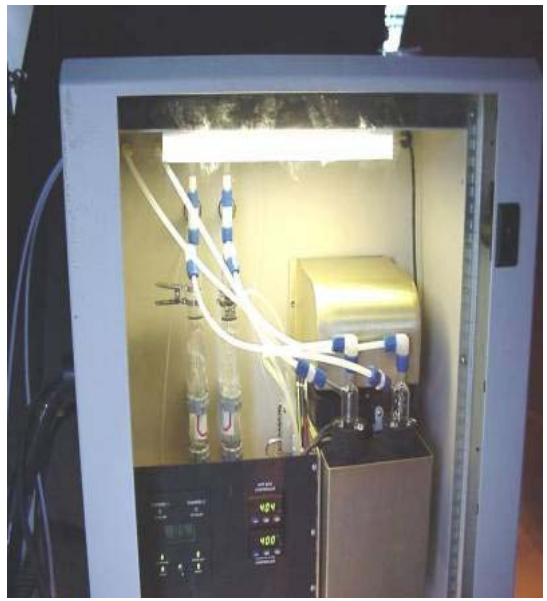
- **Evaluate longer-term Hg emissions**
  - Ontario Hydro method – 2 hr. snapshot
  - ~1 month studies w/ SCEMs
  - Effect of plant operations, e.g. coal
- Quantify variability; incorporate into regulatory standards
- Assist in planning for controls

Data Handling, Treatment

- **Data point every ~3 to 5 minutes**
- **Focus on total Hg data "representative" of normal operation**
- **Screened out:**
  - Calibration data
  - Out of service
  - Elemental Hg data
  - "Outliers" – greater than 200% of the rolling hour average
- Calculated hourly, daily averages

Summary Observations

- **Significant variability in Hg emissions**
  - Hourly averages ranging up to 10x
  - Daily averages up to 5x
- **Bituminous coals appear to have more measured variability**
  - Need more PRB, lignite data
  - Real? Higher % oxidized and Hg removals
  - Artifact? Oxidized Hg more challenging
- **Spikes do no significantly affect the calculated means (1 decimal place)**
  - Only conducted 1 “precision” test
- **Sample conversion system – possible source?**
  - Flue gas chemistry may be a factor



Longer-Term Power Plant Sites

Plant/ Unit	Fuel				Air Pollution Control							Boiler		
	Bit.	Sub.	Blend	Lig.	ESPc	ESPh	FF	SCR	VS	FGD	SD/FF	Wall	Tang.	Cycl.
SCR Sites														
S2														
S4														
S5–U1														
S5–U3														
S6–U1														
S6–U2														
S6–U4														
S7–Ongoing														
Long-Term														
L1–U1														
L1–U7														
L2–U1				80/20										
L2–U3				80/20										
L3														
L4														
L5–Ongoing														
L6–Ongoing														
L7–Ongoing														

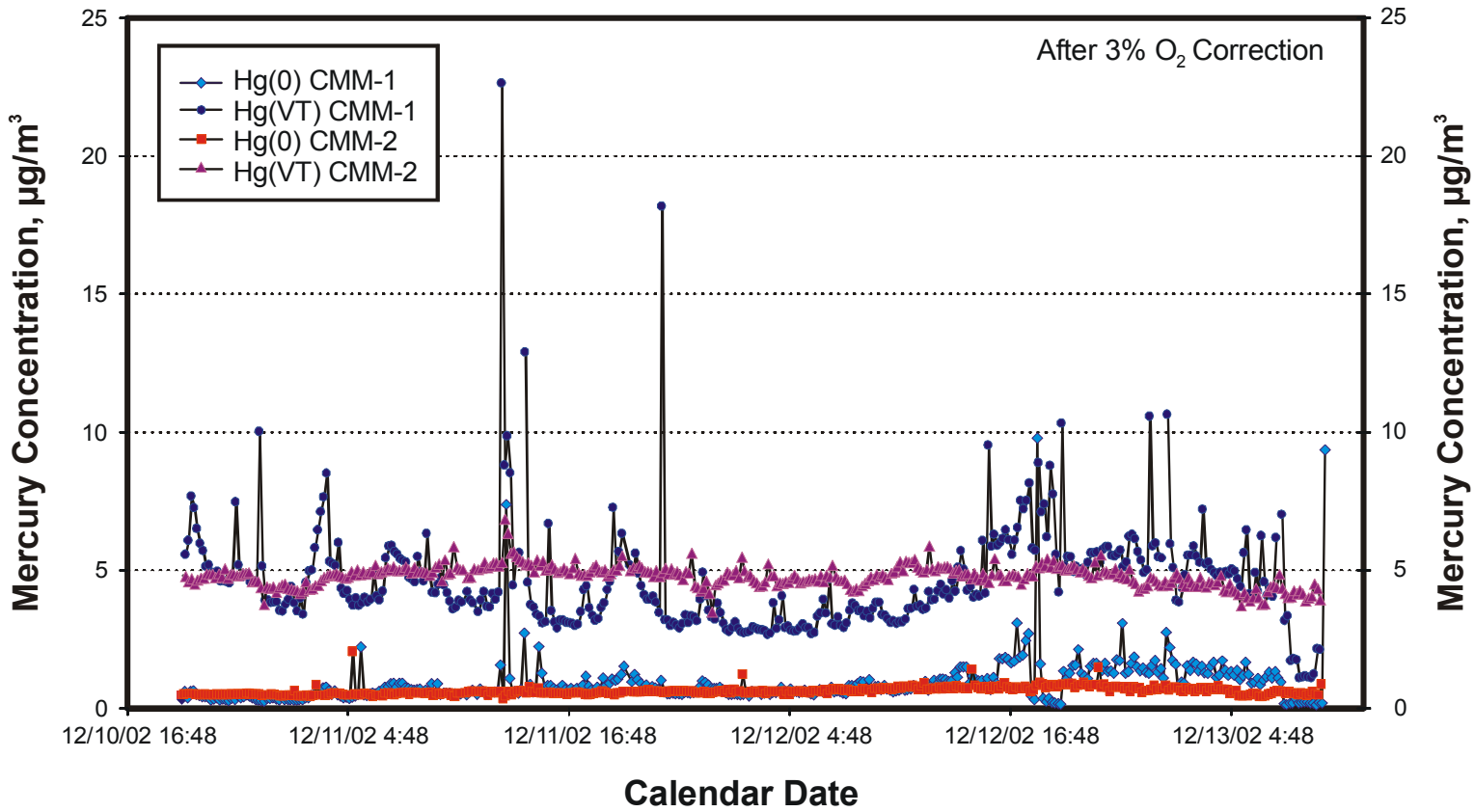
Mercury Variability

	Hourly Averages		
Unit Tested	**Mean**	**Std. Dev.**	**Rel. SD**
Bit. ESP	6.9	2.1	0.30
Bit. ESP	5.9	3.5	0.59
Bit. ESP	5.8	2.5	0.43
Bit. ESP	7.5	1.0	0.13
Bit. FF	2.6	1.6	0.62
Bit. SCR ESP	5.4	2.6	0.48
Bit. SCR ESP	5.2	1.6	0.31
Bit. SCR ESP	4.7	2.2	0.47
Bit. SCR VS In	6.4	1.9	0.30
Lignite/PRB ESP	16.9	4.2	0.25
Lignite/PRB FF	34.3	6.4	0.19
PRB SD FF	10.0	0.9	0.09
PRB SD In	9.5	1.3	0.14

RSD > 30% for hourly averages.

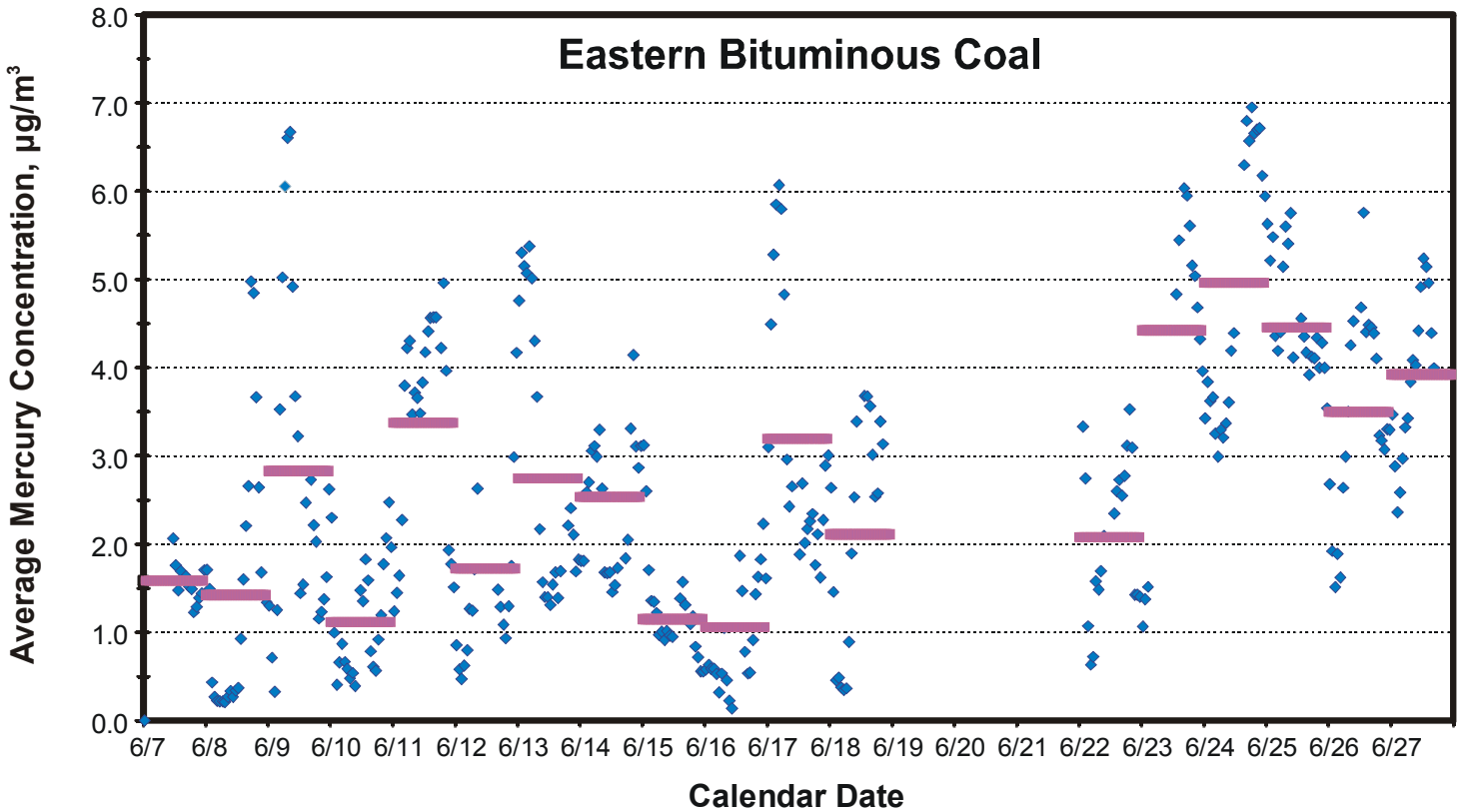
Some units include FGD; measurements conducted at FGD inlet; unable to operate in wet stack.

"Side-by-Side" CMM Systems Indicate That CMMs Yield Variability [High-S, -Cl Bit. Coal]



Work Done by Western Kentucky University

Mercury Variability at the Stack – Hourly and Daily Averages



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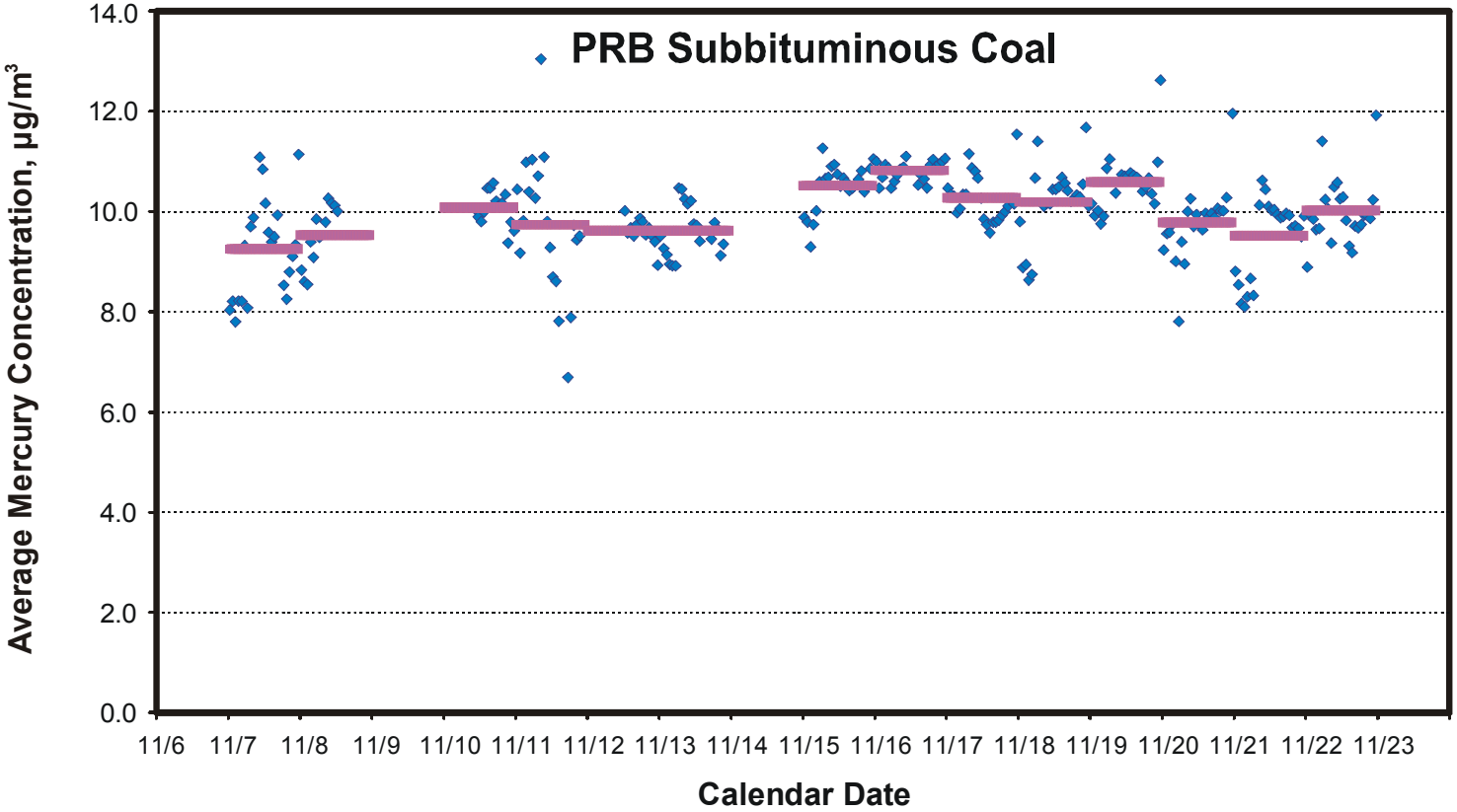

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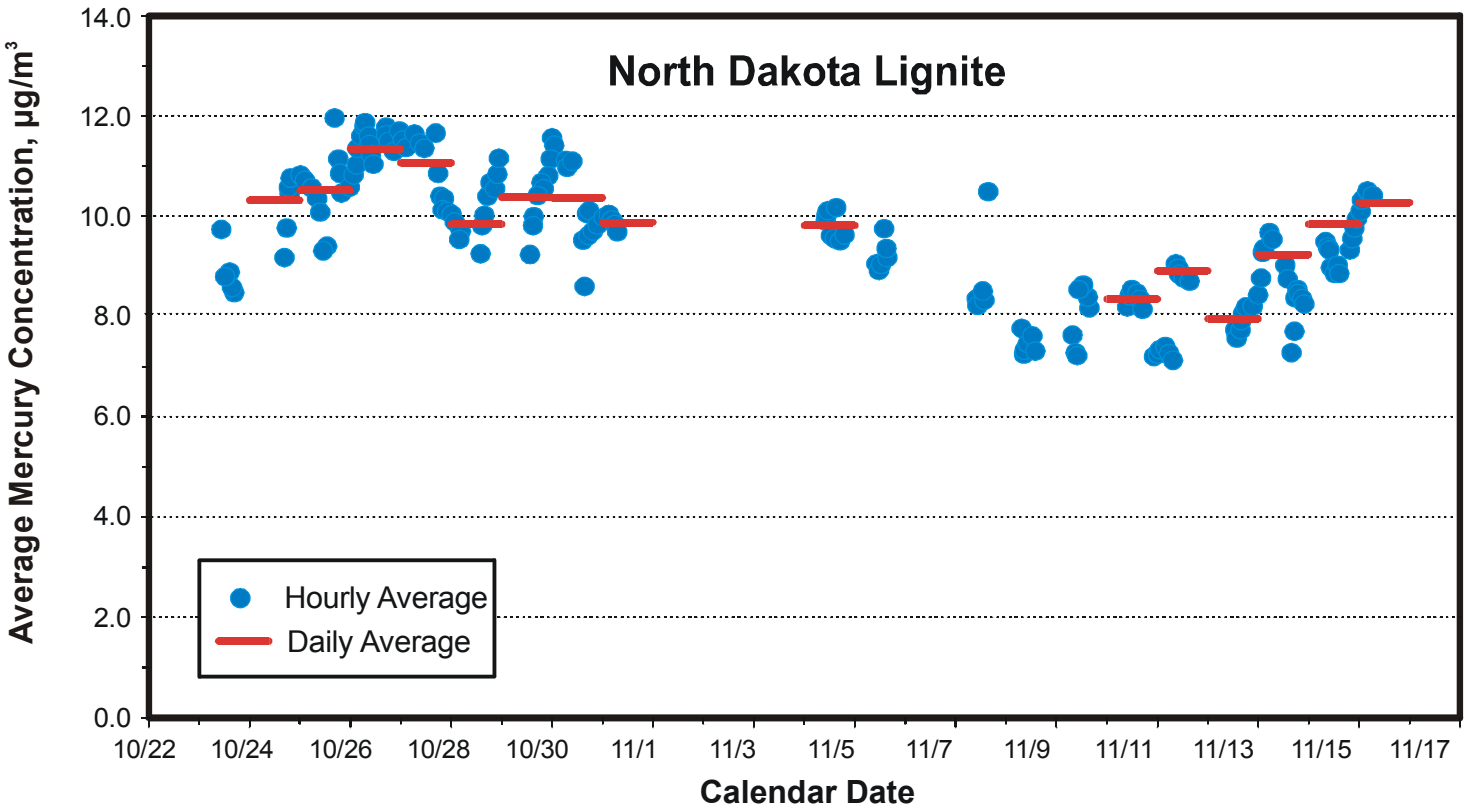
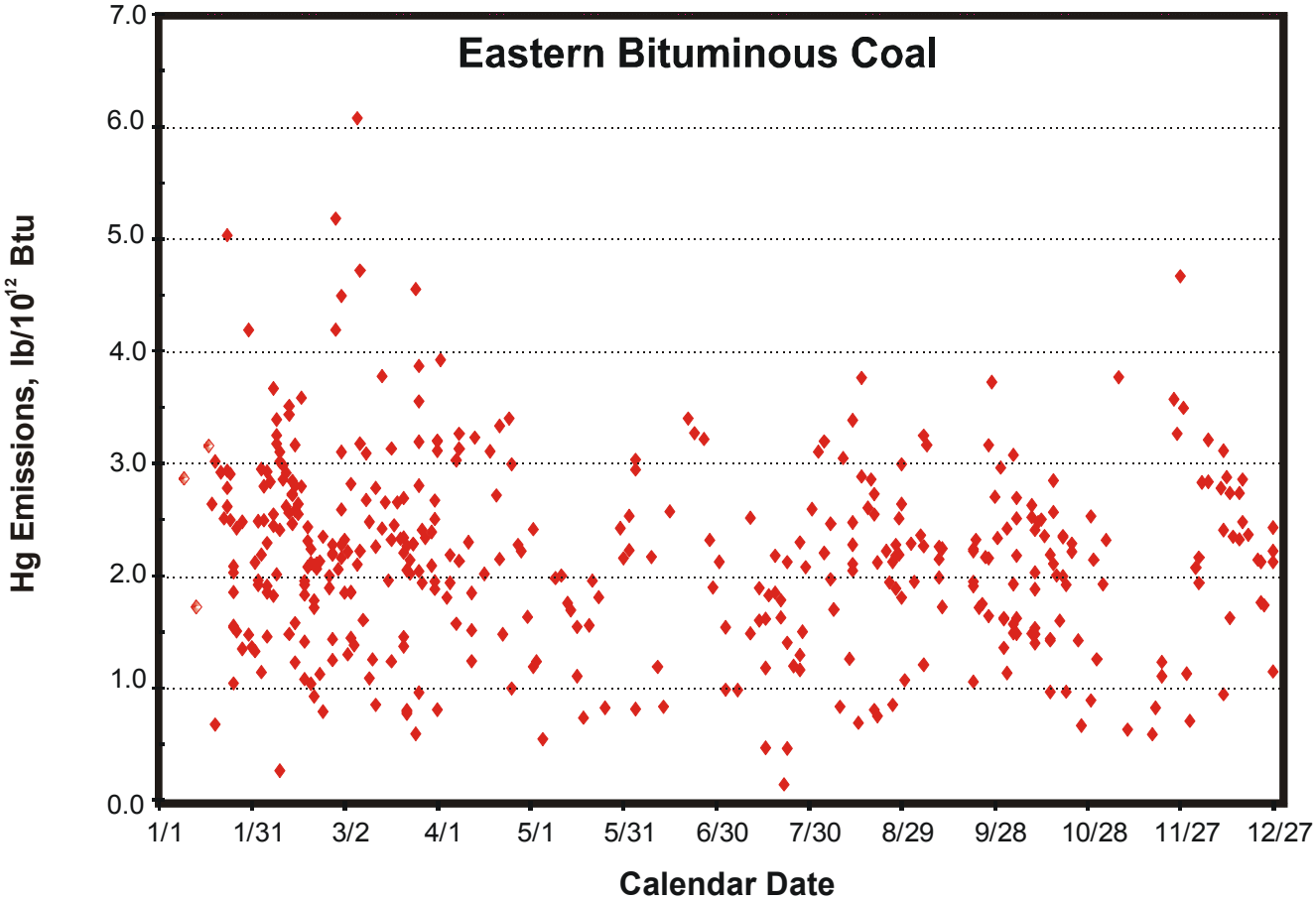


Predicted Mercury Emission Factors Based on IRC Coal Data



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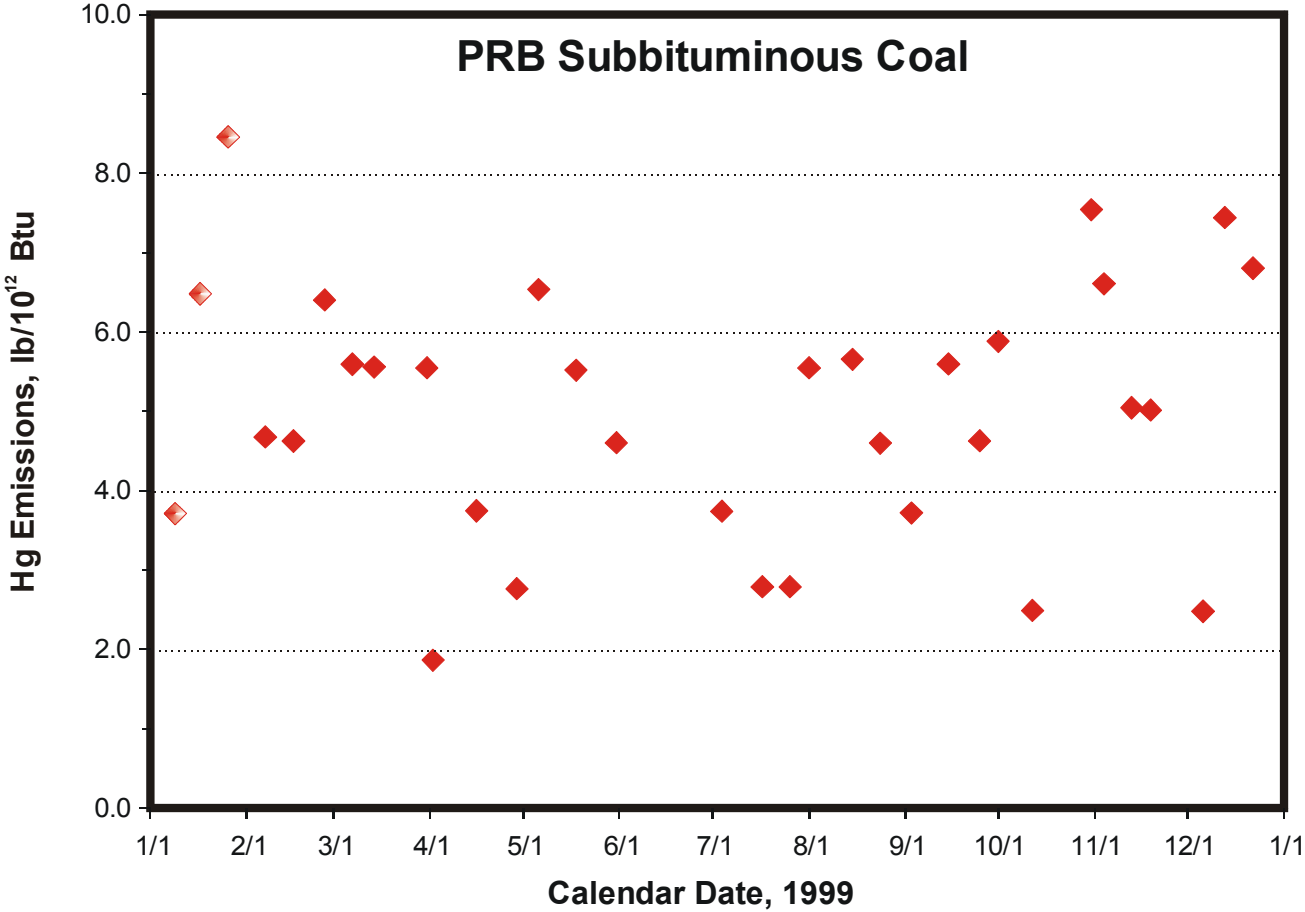

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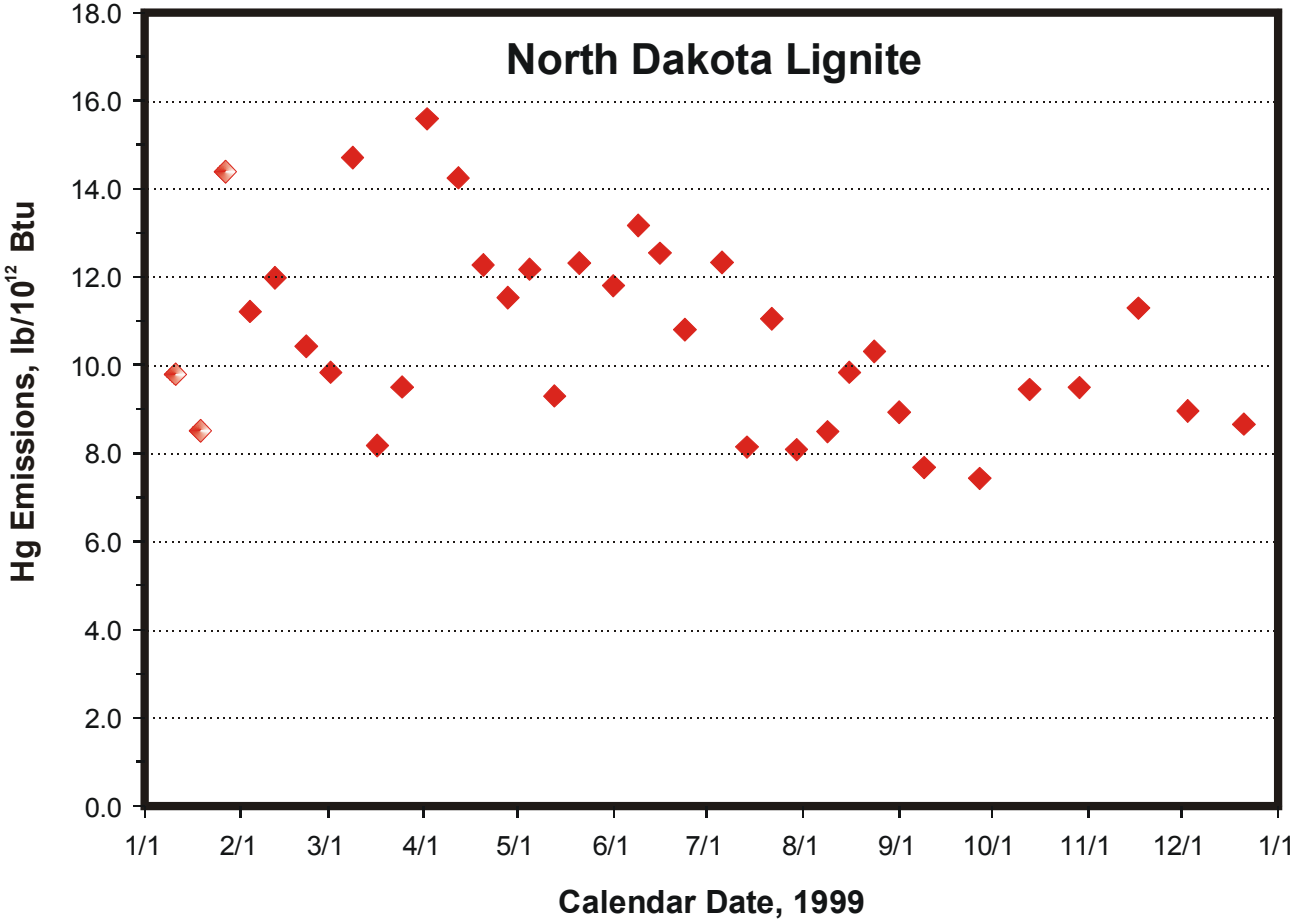

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